Section-by-Section Analysis of H.R. 28

The High-Performance Computing Revitalization Act of 2005

Sec. 1. Short Title

"High-Performance Computing Revitalization Act of 2005."

Sec. 2. Definitions

Amends section 4 of the High-Performance Computing Act of 1991 (HPC Act) to further elaborate on, or amend, the definition of terms used in the Act:

- "Grand Challenge" means a fundamental problem in science or engineering, with broad economic and scientific impact, whose solution will require the application of high-performance computing resources and multidisciplinary teams of researchers;
- "High-performance computing" means advanced computing, communications, and information technologies, including supercomputer systems, high-capacity and high-speed networks, special purpose and experimental systems, applications and systems software, and the management of large data sets;
- "Program" means the High-Performance Computing Research and Development Program described in section 101;
- "Program Component Areas" means the major subject areas under which are grouped related individual projects and activities carried out under the Program.

Strikes the definition of "Network" because it refers to the National Research and Education Network, which no longer exists as such.

Sec. 3. High-Performance Computing Research and Development Program

Amends section 101 of the HPC Act, which describes the organization and responsibilities of the interagency research and development program originally referred to as the National High-Performance Computing Program—and renamed the High-Performance Computing Research and Development Program in this Act. Requires the program to:

- Provide for long-term basic and applied research on high-performance computing;
- Provide for research and development on, and demonstration of, technologies to advance the capacity and capabilities of high-performance computing and networking systems;
- Provide for sustained access by the research community in the United States to high-performance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, including provision for technical support for users of such systems;
- Provide for efforts to increase software availability, productivity, capability, security, portability, and reliability;

- Provide for high-performance networks, including experimental testbed networks, to enable research and development on, and demonstration of, advanced applications enabled by such networks;
- Provide for computational science and engineering research on mathematical modeling and algorithms for applications in all fields of science and engineering;
- Provide for the technical support of, and research and development on, high-performance computing systems and software required to address Grand Challenges;
- Provide for educating and training additional undergraduate and graduate students in software engineering, computer science, computer and network security, applied mathematics, library and information science, and computational science;
- Provide for improving the security of computing and networking systems, including research required to establish security standards and practices for these systems.

Requires the Director of the Office of Science and Technology Policy (OSTP) to:

- Establish the goals and priorities for Federal high-performance computing research, development, networking, and other activities;
- Establish Program Component Areas that implement the goals established for the Program and identify the Grand Challenges that the Program should address;
- Provide for interagency coordination of Federal high-performance computing research, development, networking, and other activities undertaken pursuant to the Program;
- Develop and maintain a research, development, and deployment roadmap for the provision of high-performance computing systems for use by the research community in the United States.

Leaves substantially unchanged the provisions of the HPC Act requiring the Director of OSTP to:

- Provide an annual report to Congress, along with the annual budget request, describing the implementation of the Program, including current and proposed funding levels and programmatic changes, if any, from the previous year;
- Consult with academic, State, and other appropriate groups conducting research on and using high-performance computing.

Requires the Director of OSTP to include in his annual report to Congress:

- A detailed description of the Program Component Areas, including a description of any changes in the definition of activities under the Program Component Areas from the previous year, and the reasons for such changes, and a description of Grand Challenges supported under the Program;
- An analysis of the extent to which the Program incorporates the recommendations of the Advisory Committee established by the HPC Act—currently referred to as the President's Information Technology Advisory Committee (PITAC).

Requires PITAC to conduct periodic evaluations of the funding, management, coordination, implementation, and activities of the Program, and to report to Congress once every two fiscal years, with the first report due within one year of enactment.

Repeals section 102 of HPC Act, the "National Research and Education Network," which required the development of a network to link research and educational institutions, government, and industry. This network was developed but has since been supplanted by the Internet.

Repeals section 103 of the HPC Act, "Next Generation Internet," as this program is no longer in existence.

Sec. 4. Agency Activities

Amends section 201 of the HPC Act, which describes the responsibilities of the National Science Foundation (NSF) under the Program. Requires NSF to:

- Support research and development to generate fundamental scientific and technical knowledge with the potential of advancing high-performance computing and networking systems and their applications;
- Provide computing and networking infrastructure support to the research community in the United States, including the provision of high-performance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, including support for advanced software and applications development, for all science and engineering disciplines;
- Support basic research and education in all aspects of high-performance computing and networking.

Amends section 202 of the HPC Act, which describes the responsibilities of the National Aeronautics and Space Administration (NASA) under the Program. Requires NASA to conduct basic and applied research in high-performance networking, with emphasis on:

- Computational fluid dynamics, computational thermal dynamics, and computational aerodynamics;
- Scientific data dissemination and tools to enable data to be fully analyzed and combined from multiple sources and sensors;
- Remote exploration and experimentation;
- Tools for collaboration in system design, analysis, and testing.

Amends section 203 of the HPC Act, which describes the responsibilities of the Department of Energy (DOE) under the Program. Requires DOE to:

- Conduct and support basic and applied research in high-performance computing and networking to support fundamental research in science and engineering disciplines related to energy applications;
- Provide computing and networking infrastructure support, including the provision of high-performance computing systems that are among the most advanced in the world in

terms of performance in solving scientific and engineering problems, and including support for advanced software and applications development, for science and engineering disciplines related to energy applications.

Amends section 204 of the HPC Act, which describes the responsibilities of the Department of Commerce, including the National Institute of Standards and Technology (NIST) and the National Oceanic and Atmospheric Administration (NOAA), under the Program.

Requires NIST to:

- Conduct basic and applied metrology research needed to support high-performance computing and networking systems;
- Develop benchmark tests and standards for high-performance computing and networking systems and software;
- Develop and propose voluntary standards and guidelines, and develop measurement techniques and test methods, for the interoperability of high-performance computing systems in networks and for common user interfaces to high-performance computing and networking systems;
- Work with industry and others to develop, and facilitate the implementation of, high-performance computing applications to solve science and engineering problems that are relevant to industry.

Requires NOAA to conduct basic and applied research in high-performance computing applications, with emphasis on:

- Improving weather forecasting and climate prediction;
- Collection, analysis, and dissemination of environmental information;
- Development of more accurate models of the ocean-atmosphere system.

Amends section 205 of the HPC Act, which describes the responsibilities of the Environmental Protection Agency (EPA) under the Program. Requires EPA to conduct basic and applied research directed toward the advancement and dissemination of computational techniques and software tools with an emphasis on modeling to:

- Develop robust decision-support tools;
- Predict pollutant transport and their effects on humans and on ecosystems;
- Better understand atmospheric dynamics and chemistry.